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# Machine Vision Based Smart Road Traffic Management System Using Myrio

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**Abstract** – Traffic on roads especially in India is becoming a major issue day by day. Urban regions are mostly crowded by private vehicles, which tend to create more traffic jams. Recent surveys states that, in India there were 1 million licensed vehicles during the year 2014, but it is now drastically raised due to overpopulation and rapid industrialization. The present method of traffic control with the aid of traffic signals proved to be non-effective as many a times during nights, these signals tend to malfunction. There are also traffic issues during power failures. Technology has been improved in vehicular systems, yet its harnessing traffic management systems were still the same. The easiest way to control traffic is to make use of timers, but it won't be effective during peak hours. To overcome such systems, Digital Image Processing can become a great tool. This paper aims in making use of such system along with solar energy. A digital camera is placed beneath the signal lights, which monitors the traffic and changes the signals accordingly. Casuality and crisis management is also added as an additional feature to enhance the project.

**Index Terms** – Digital Image Processing, LabVIEW – myRIO, Smart traffic management system, Intelligent Transportation System (ITS), CCTV synchronization

## 1 INTRODUCTION

### 1.1. Motivation for the project

In the recent years it has become mandatory to harness traffic signals, as it is a must process by which many road accidents can be prevented. Many road accidents have occurred due to the faulty functioning of the road signals.Hence it is important to assure the cent percent working of the traffic signals. The problem has become more persistent due to over population and traffic violations.Many technological advancements have been made in the recent era. Fuzzy controllers and Artificial Neural Networks can also be used for controlling the traffic signals, but they proved not to be user friendly and they also have a threat of being hacked or manipulated. Present traffic controllers are based on pre-programmed fixed off delay timers, which has no use high dense traffic areas. There is also a wastage in fuel due to unwanted waiting time. As a result, less congested zones gets more unwanted time for green signal, whereas the traffic accumulation gets more and more in congested zones.

Ref [12] speaks intensively about the road accidents that occur in India. It also speaks that most accidents occur during the peak hours and most of the males of age group between 30 and 59 are prone to death. It also predicts that the number of deaths due to road accidents by the year 2025 will be around 250,000 which is a bitter truth if this situation continues.

Nearly 50% of the death occur at traffic junctions. In a survey made in the year 2013, 75,200 people have lost their lives at traffic crossings, while 60,000 of that were at road crossings.Fig 1.1 explain the scenario of a traffic congestion during peak hours in Urban cities.Fig 1.2 explains the scenario that will happen due to improper crossing at traffic signals.

Figure 1.1 Traffic congestion in Urban

Figure 1.2 Accident due to improper crossing

### 1.2. Existing technology

Ref [1] says about the creation of a Graphical User Interface to all the users, which contains the traffic timer, speed limit, over speed alert and a fine incurred indicator. It wirelessly transmits and receives data between the master controller and the traffic control centre. It mainly focuses on in vehicle navigation alert systems. Simulation of LabVIEW by assuming the traffic to be constant is made in [2]. It uses NI USB 6009 to control the traffic lights. The existing methodologiesthat are carried out till date for road traffic management is explained in [3]. It explains about the various technologies and finally concludes that GPS based traffic monitoring system is comparably better than other technologies, but it also lacked several disadvantages, such as incurring huge capital cost, mobile number of individual has to be known, signal strength etc,. System [4] says about the control of traffic by diverting the traffic at huge dense traffic areas. It uses a CCTV camera to analyse the traffic and monitors for traffic jams. [5] Speaks about the various cloud based technologies, that are available for controlling road traffic and says about Sensor-Cloud network. System [6] says about the use of MATLAB as the tool for detecting the traffic using Digital Image Processing. It sends the alert messages regarding the road traffic through LCD boards, placed on top of the signals. [7] Speaks about the use of edge detection algorithm to detect the vehicles and based on that, controlling of signal is done. System [8] uses infrared sensors, placed on the dividers to detect the number of vehicles on the particular road to switch between the signals. [9,11]are similar techniques, which uses Digital Image Processing to detect the vehicles and to control the traffic. System [10] is a review paper, which tells about the various control measures and their pros and cons. It further speaks about the Sobel, Prewitt, and Robert, Canny edge detection algorithms.[13] Focuses on the case study of Road Traffic Control at Andhra Pradesh. It also identifies and analyzes the risk types and recommends the prevention strategies. [14] Speaks about the use of IMAQ Driver of LabVIEW to depict a ROI using geometrical pattern and contour edge detection.

### 1.3. Demerits of prevailing technology

The system [1] finds difficulty in installing the setup to all domestic vehicles, as it involves high costs during installation. WiFi is also a major issue in remote areas, as many of the highways are left with no network connectivity. System [2] proved not to be very helpful, since it is designed for a constant traffic system. Since the traffic in any Urban cities is un-uniform and unexpected, this system cannot be implemented.System [4] is not very helpful, as it provides only indications regarding the traffic conditions. Being a review paper, [5] speaks only about the various options and tells about their pros and cons. Though [6] proves to be a useful one, it consists of MATLAB codes, which has complex algorithms and it requires a Computer and fails to be a stand-alone model. Though [7] is a viable one, it uses only edge detection algorithm to detect the presence of vehicles. It also uses the MATLAB software for the detection of vehicles. System [8] though it is a useful one, it has too many complications as it involves additional incorporation of GPS and Bluetooth modules to all vehicles at the time of manufacturing and it only uses IR sensors to detect the count of vehicles. [9,11]are quite effective but it also has a disadvantage of creating a complex algorithm for controlling the traffic. It uses grey scale processing and edge detection algorithms in MATLAB to control the traffic, but the efficiency will be quite low as it involves less rectification processes. Being a review paper [10] really speaks much in detail about the uses of various algorithms and their pros and cons, but it focuses only on edge detection methods, rather than taking a huge area. Though [14] depicts about the use of IMAQ Image driver software, it could be used only for defining geometrical patterns.

### 1.4. Proposed system

The proposed system aims in developing a system which could smartly think on the traffic count and opens / closes the signals for a particular route. Instead of taking the time constrain, the proposed system takes the vehicle count into consideration. The system also prioritizes the ambulance, since it uses Digital Image Processing. Crisis management is added as a safety measure in order to eliminate the loss of lives due to negligence in passing the information about the accident to the nearby hospitals / ambulance.

### 1.5. Concept of the project

The system counts the vehicles by edge detection method then compares with other sides and controls the signal. Ambulance, fire brigade and police vehicles are given priorities and hence their signals are relieved first. The overall general block diagram is as shown in the Fig 1.3.

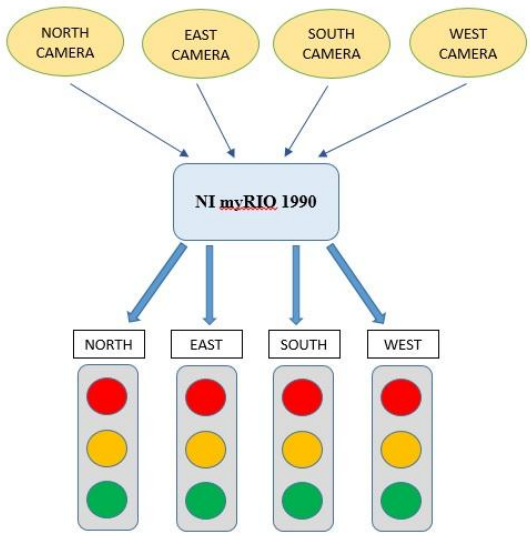


Figure 1.3 Block Diagram

## 2 COMPONENTS AND ITS PROPERTIES

### 2.1. LabVIEW

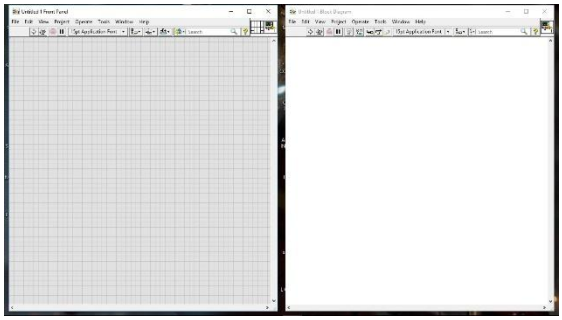

Figure 2.1 LabVIEW User Interface

Laboratory Virtual Instrumentation and Engineering Workbench is the extension for LabVIEW. It is a graphical programming language, which has a front panel, that resembles the industrial panel and a block diagram, where the icons are pick and placed and hot wiring technique is followed. A LabVIEW User Interface is been shown in Fig 2.1.

### 2.2. MyRIO

MyRIO is a standalone hardware designed by National Instruments, in which the LabVIEW codes are dumped in and it controls the output devices by considering the inputs. The myRIO 1990 hardware is as shown in the Fig 2.2.

Figure 2.2 myRIO 1990

### 2.3. IR Camera

The digital camera is an Night Vision Infrared based camera, used to capture the vehicle and increment the count. The camera has a USB interface to get configured with the myRIO 1990. With its 360° lens, it can able to capture all the vehicles in the road. The camera is as shown in the Fig 2.3.

Figure 2.3 IR Camera

## 3 WORKING

In the recent years the number of private vehicles have been raised drastically and it led to many road accidents since the youngsters have been using the two wheelers without proper safety aid and improper speed at improper places.

Accidents also occur due to avoiding the signals. Since the usage of private vehicles is raised, it led to traffic jams and congestions at many urban cities. To overcome these issues, traffic density based signal switching approach could be a viable solution. The existing system was developed by using LabVIEW to explain the working of the time based mechanism, as shown in Fig 3.1 and Fig 3.2.

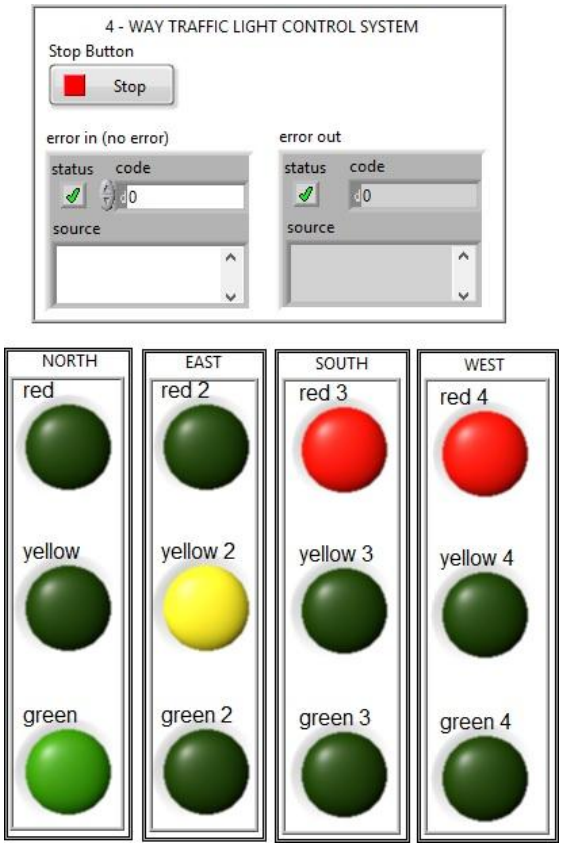


Figure 3.1 LabVIEW Front panel of Existing system

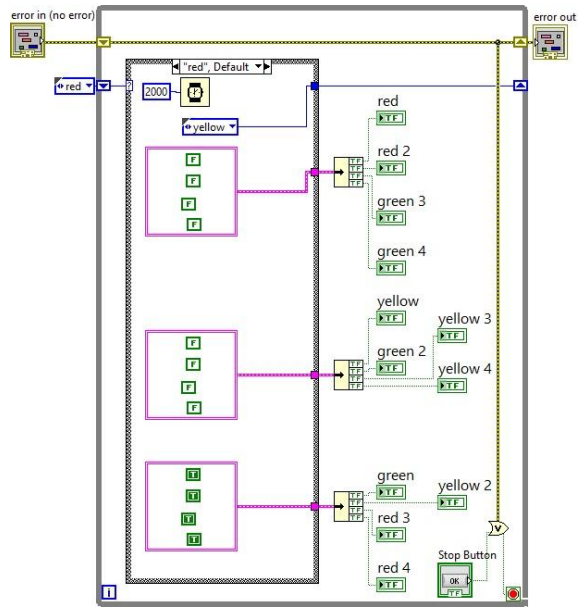


Figure 3.2 LabVIEW block diagram of Existing system

Hence the system focuses on counting the number of vehicles that crosses the road and decides the switching of signals. Image processing technique has been implemented for detecting the vehicles. Edge detection and feature extraction are used. The system acquires the count of the vehicles from all the four directions and compares with each other and based on the number of vehicles, releasing of that particular signal is made. The system also scans for ambulances, police and fire brigade vehicles and give priority to that particular track. If the system checks all the directions and based on the above mentioned priority, one of the direction is opened and for the next time, that signal is eliminated from the process and remaining three directions are taken into account for comparison. The same process is repeated until all the four directions are released for one complete cycle. Priority call is irrespective of the signal release cycle. The system is also equipped with a built in timer so that if the track is opened, it will not prolong till the traffic in that road gets cleared. By the help of this timer, as soon as the maximum exempted time reaches for that track, the signal for the track will turn red and paves the way for other tracks. The fully functional model is as illustrated in Fig 3.3.

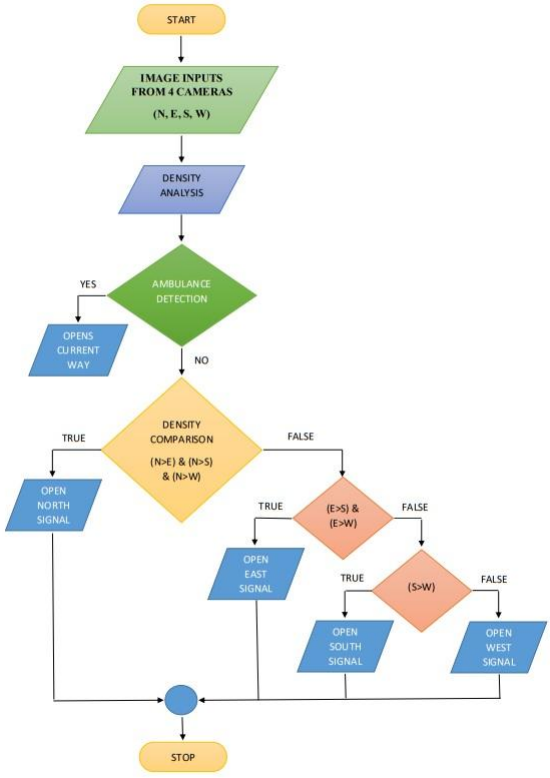


Figure 3.3 Fully Functional model

Casuality management system is added as an additional feature in order to avoid the loss of life due to road accidents. If an accident occurs in the road, it will be captured and the information regarding the accident will be passed on to the nearby traffic police so as to eliminate the death due to negligence. The system for casuality detection and passing of information to nearby hospital is illustrated in the Functional diagram Fig 3.4.

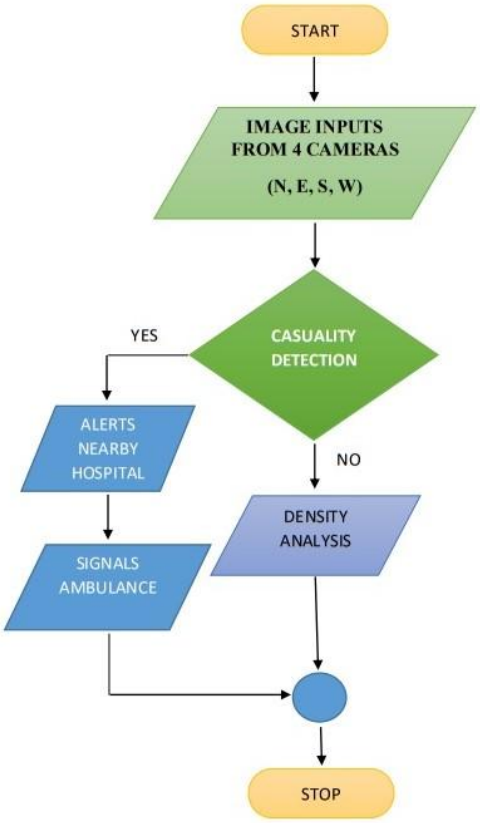


Figure 3.4 Casuality detection algorithm

## 4FEASIBILITY STUDY

Feasibility study has become a mandatory step in productizing any project, since it determines the robustness of the project. The proposed system proves to be technically and economically feasible, as it uses readily available components, which also proves to be worth for the cost paid.

## 5MERITS AND DEMERITS

### 5.1. Merits

- ❖ No more traffic jams since signal is released based on traffic density
- ❖ Autonomous system – no human intervention
- ❖ Provides an easier solution for Urban traffic problems

### 5.2. Demerits

- ❖ Image processing techniques could be hard at times to detect the vehicles
- ❖ It may be difficult for the people to follow an entirely new pattern in road traffic control

## 6 CONCLUSION

Thus the above said system proves to be a greater tool in managing the traffic jams in high dense traffic areas.This could be a viable system for eliminating the mess of traffic congestions in urban areas.The paper illustrates that Digital Image Processing proves to be the most suitable method that could be used for controlling the traffic signals.

It could also eliminate the loss of life due to negligence in passing of information regarding the accident to the ambulance since it transfers the information automatically.

## 7 FUTURE SCOPE

As an additional feature, there can be an additional camera, placed down to the main camera to make the feature extraction of the number boards of the speeding vehicles, if they tend to bypass the signal, irrespective of the control. The vehicle registration number from the number plate is acquired by using Optical Character Recognition and is sent to the traffic police, located near to the signal.

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